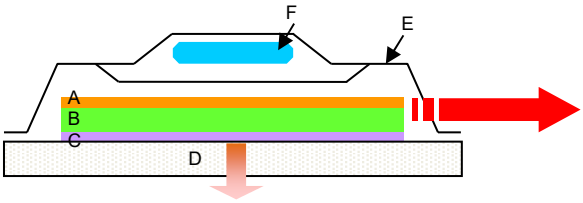
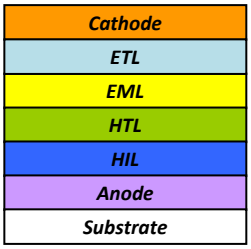
Analytical Techniques Available for OLEDs

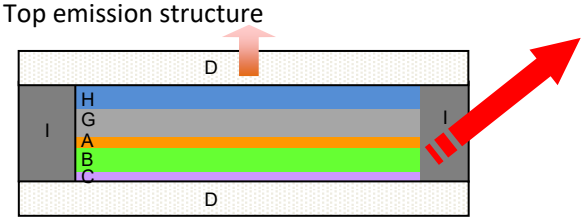
Typical Structure of OLED

Bottom emission structure





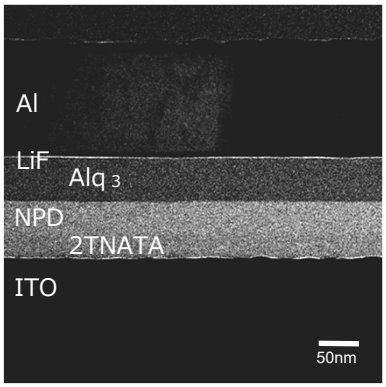
Top emission structure



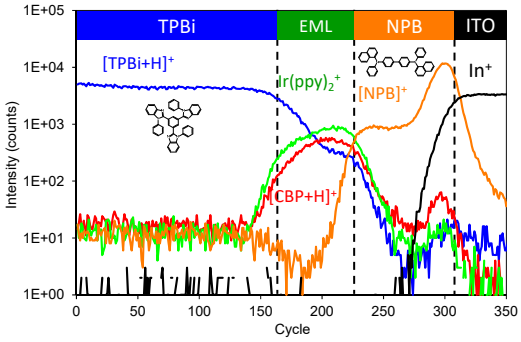
A : Cathode
B : OLED stack
C : Anode
D : Substrate
E : Package
F : Desiccant
G : Thin film encapsulation
H : Optical films, etc.
I : Edge sealant

Examples of analysis

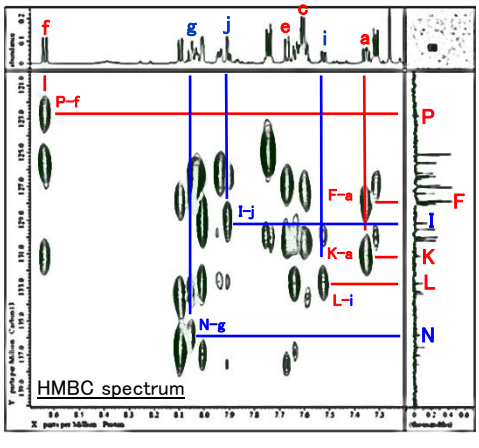
High-contrast TEM

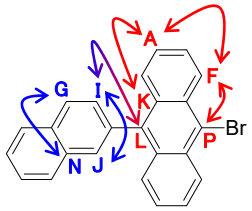


Depth profile of organic components by GCIB-TOF-SIMS



2D-NMR analysis of an organic impurity in OLED material





Analytical techniques

Objective	Analytical purposes	Analytical techniques
Cathode, Anode	Compositional analysis	RBS, XPS
	Distribution of inorganics	SIMS, TEM-EDX
	Crystallinity	XRD, ASTAR
	Surface morphology	AFM, SEM
OLED stack	Cross-sectional imaging including thickness of each layer	High-contrast TEM
	Luminescence property	PL, EL, GSP+PL (PL on inclined surface)
	Chemical structure of host and dopant	GCIB-TOF-SIMS, LC/MS, MS/MS, NMR and GC/MS after LC separation
	Chemical structure of organic impurities and degradation products	GCIB-TOF-SIMS, LC-UV, LC-FL, LC/MS, MS/MS, LESA, LDI-MS
	Microanalysis of organics	TOF-SIMS
	Microanalysis of inorganics	TEM-EDX
	Distribution of inorganic impurities (interlayer diffusion, interface)	SIMS
	Film density	XRR
	Thickness, optical properties	Spectroscopic ellipsometry
	Molecular orientation	Spectroscopic ellipsometry, polarized Raman, polarized FT-IR, angle-resolved XAFS
	Crystallinity	In-Plane XRD, Raman
	Surface morphology	AFM, SEM
	Work function of single layer	XPS
	Work function of multi layer	GSP+KPFM (KPFM on inclined surface)
OLED material	Inorganic impurities	ICP-MS
	Thermal properties	TG, DSC
	Outgas	GC/MS, TPD-MS
TFT	Crystallinity, grain analysis	EBSD, ASTAR
	Inorganic impurities	SIMS, TEM-EDX
	Distribution of dopants	SCM, SSRM
	Defect, film properties	CL, Raman, TEM, ESR
Encapsulation (Resin, TFE)	Compositional analysis	TOF-SIMS, micro-FT-IR, TEM-EDX, SEM-EDX
	Sealing property	SIMS with isotope marker
	Outgas from resin	GC/MS, TPD-MS